MOBILITY DEVICE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 15/787,613, filed on Oct. 18, 2017 entitled MOBILITY DEVICE (Atty. Dkt. No. W10), and a continuation-in-part of U.S. patent application Ser. No. 15/982,737, entitled SYSTEM AND METHOD FOR SECURE REMOTE CONTROL OF A MEDICAL DEVICE, filed on May 17, 2018 (Atty. Dkt. No. X55), which are incorporated herein by reference in their entirety. This application claims the benefit of U.S. Provisional Application Ser. No. 62/532,993, filed Jul. 15, 2017, entitled MOBILITY DEVICE IMPROVEMENTS (Attorney Docket No. U30), U.S. Provisional Application Ser. No. 62/559,263, filed Sep. 15, 2017, entitled MOBILITY DEVICE SEAT (Attorney Docket No. V85), and U.S. Provisional Application Ser. No. 62/581,670, filed Nov. 4, 2017, entitled MOBILITY DEVICE SEAT (Attorney Docket No. W07), which are incorporated herein by reference in their entirety.

BACKGROUND

[0002] The present teachings relate generally to mobility devices, and more specifically to vehicles that have heightened requirements for safety and reliability.

[0003] A wide range of devices and methods are known for transporting human subjects experiencing physical incapacitation. The design of these devices has generally required certain compromises to accommodate the physical limitations of the users. When stability is deemed essential, relative ease of locomotion can be compromised. When transporting a physically disabled or other person up and down stairs is deemed essential, convenient locomotion along regions that do not include stairs can be compromised. Devices that achieve features that could be useful to a disabled user can be complex, heavy, and difficult for ordinary locomotion. Some systems provide for travel in upright positions, while others provide for ascending or descending stairs. Some systems can provide fault detection and operation after a fault has been detected, while others provide for transporting a user over irregular terrain.

[0004] The control system for an actively stable personal vehicle or mobility device can maintain the stability of the mobility device by continuously sensing the orientation of the mobility device, determining the corrective action to maintain stability, and commanding the wheel motors to make the corrective action. Currently, if the mobility device loses the ability to maintain stability, such as through the failure of a component, the user may experience, among other things, discomfort at the sudden loss of balance. Further, the user may desire enhanced safety features and further control over the reaction of the mobility device to unstable situations.

[0005] Mobility devices such as, for example, wheelchairs, typically include a seat that is integrated with a chassis and wheels. Seats can include a variety of features, and some seats may be structured to help a user accommodate for certain challenges. Likewise, the mobility device chassis and wheels can come in a variety of configurations, for example some are motorized and some are not. When the seat is integrated with the chassis, the user may have to weigh the features of the integrated seat against the features of the chassis and wheels to decide which features are most important to the user. Combining the most important features in a seat with the most important features in a chassis and wheels can be useful when selecting a mobility device. Conveniently engaging a user-preferred seat with the mobility device can provide additional user options. Quickly releasing the engaged seat can provide for readily interchanging various seating options.

[0006] Wheelchair seats are further required to provide a user control device engaged therewith to maneuver the wheelchair as per user preference. Positioning of the user control (UC) can be challenging. The UC must be placed to align with comfort of the user or the wheelchair operator. Additionally, the positioning of the UC should be qualified to avoid obstructing any other movements or activities of the user. A rigidly positioned UC can cause such constraints to the user. Adjustable positioning of the UC can enable the user to perform required or routine activities without the UC's being a hindrance.

[0007] Electromagnetic holding brakes with and without manual brakes, can be coupled to each motor in a mobility device. In each brake, a friction disk that is keyed to the motor shaft can be trapped between two plates. One plate can be fixed, and the other can move axially under pressure. A magnet can be energized when the motor supply is switched on, releasing the pressure on the plates, allowing the motor shaft to rotate. A motor interface can include a prismatic profile that can mate with a like prismatic motor shaft. Mobility devices can exhibit noise under low motor speed operation. The noise can originate from the interface between the brake disk and motor coupling. This interface can function as a clearance fit between a shaft which passes through a hole in the brake disk. Because there can be a clearance in this interface, the brake disk can have rotational freedom with respect to the brake coupling. During low motor speed operation, this clearance can allow the brake disk to vibrate which can cause a sound due to motor speed fluctuations. A brake disk/motor coupling interface can reduce the vibrations while maintaining a relatively low sensitivity to brake position, the ability to transfer torque, the ability to restrain the brake disk rotational freedom under the no brake load condition, or cushion the rotational impacts that occur between the two parts.

[0008] On occasion, motors in a mobility device such as a powered wheelchair need to run faster to accommodate the needs of a user, in particular safety needs. A reliable, lightweight, and stable mobility device can include an automatic response capability to situations that are commonly encountered by a disabled user such as, for example, but not limited to positional obstacles, slippery surfaces, tipping conditions, and component failure. A mobility device can include long-lived redundant batteries, ergonomically positioned and shock buffered caster wheel assemblies, and ride management bumpers. A mobility device can include automatic mode transitions, improved performance over other mobility vehicles, remote control, and a vehicle locking mechanism. A mobility device can include foreign substance sealing and slope management, a cabled charging port, and accommodations for an increased payload over the prior art. A mobility device can include mode control based on battery charge, thumbwheel speed control, and accommodations for a loss of communications among processors.